Patient waiting times within public Emergency Centres in the Western Cape: describing key performance indicators with respect to waiting times within Western Cape Emergency Centres in 2013-2014

by

Kirsten Lesley Cohen

MPhil Emergency Medicine Patient Safety

University of Cape Town

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Supervisor:

Dr Stevan Bruijns
Senior lecturer, Division of Emergency Medicine, University of Cape Town, Cape Town, South Africa

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Abbreviations

EC: Emergency Centre

EM: Emergency Medicine

CHC: Community Health Centre

DOH: Department of Health

HREC: Human Research Ethics Committee

KPI: Key Performance Indicator

SAMJ: South African Medical Journal

SATS: South African Triage Scale

STEMI: ST-elevation Myocardial Infarct

UK: United Kingdom

USA: United States of America

Part A: Literature Review

Objectives of Literature Review

- To review reports detailing need for a focus on improvement in quality in medicine.
- To describe definitions and aspects of quality care and relevant indicators in medicine.
- To describe the current international literature around key performance indicators in emergency medicine, with a focus on waiting times.
- To describe the current key performance indicators which are recommended and used in Emergency Centres internationally.
- To describe the current South African healthcare policies referring to healthcare provision.
- To describe the current South African evidence around waiting times in South Africa.
- To describe gaps or need for further research.

Literature Search Strategy, including inclusion and exclusion criteria

To identify relevant articles a systematic search of the literature was performed. The databases PUBMED, CINAHL, SCOPUS (EMBASE) and COCHRANE were searched. Google and Google Scholar was searched to identify grey literature. In each database, a search was performed using Boolean operated terms: [emergency medicine OR emergency department OR emergency center/centre OR emergency room OR accident and emergency] AND [quality measures OR quality indicators OR performance measures OR performance indicators OR waiting times]. The filters used were: human and dates: 2009-2016. Relevant articles identified in the references of sourced articles were also sourced. Titles and abstracts were initially screened for relevance to the review. Articles with low relevance were excluded. High-quality evidence, including systematic reviews, was sought to address the aim and objectives.

Summary and Interpretation of literature

Introduction

Much emphasis has been placed on quality measurements or Key Performance Indicators (KPI's) in Emergency Medicine (EM). Internationally, KPI's are used to measure and improve quality of care. There is a major emphasis on waiting times, usually measured as time-based KPI's. These waiting times are usually related to the various stages of a patient journey through the Emergency Centre (EC). The Western Cape provincial healthcare 2030 plan outlines "reduced waiting times" as one of the indicators to be used to measure the progress of the healthcare 2030 plan, and EC waiting times have been formalised as annual operational plan measures. (1) However, waiting times have not been routinely measured on a national level. The Western Cape Government has conducted audits in recent years to measure these. The manuscript presented in part B describes an analysis of a selection data from these audits.

On quality in healthcare

The focus on quality in medicine has previously been led by external businesses and regulatory organisations rather than clinicians. Market forces, high profile cases, litigation, increased awareness of adverse events and the importance of good systems for patient care have all contributed to the increased focus on quality care by clinicians and hospital management. In line with other industries, healthcare has moved from an external regulatory model to a more internal approach to delivering quality care – one that is guided by patient needs. (2–5) The late nineties saw reports from regulatory bodies highlighting serious problems with the quality of acute health care delivery. (2–5) A Committee on the Quality of Healthcare in America was convened in 1998 with a focus on evidence based delivery of quality care and developing strategies to improve this. (6) Key to this is tracking EC performance and outcome measures for accountability and to support improvement on quality care.

Much discussion has been had around defining quality of care in medicine as well as how to measure it. (7,8) Generally, the expectations of the customer will determine the expected quality of a service. A good definition of quality is ''the degree to which health services for individuals and populations increase the likelihood of desired health outcomes, and are consistent with current professional knowledge.'' (9) Louis Graff, et al. define quality in medical care as ''the care health professionals would want to receive if they got sick.'' (5) In medicine, the patient as

the customer may not be an informed judge of the technical aspects of quality medical care, although they most certainly would have expectations related to the service aspect. Campbell, et al. emphasised that while quality should be seen from the patient's perspective (as individual care) they acknowledged that this must be within the context of providing health care on a population level, and that equity and efficiency of use of resources must also be considered. (10) The Institute of Medicine's 2001 report: "Crossing the Quality Chasm", describes six aspects of quality emergency care as safe, timely, efficient, equitable, effective and patient-centered. (9) Timely care is clarified further as "reducing waits and sometimes harmful delays for both those who receive and those who give care." (9) This quality framework has been adopted by the Western Cape Provincial Department of Health, as set out in Healthcare 2030. (1)

Assessment and monitoring of quality of care is becoming increasingly important from a variety of perspectives. There is increasing pressure on healthcare systems from growing populations and heightened patient expectations which must be balanced with increasing medical costs and finite resources. (3,4) Resource limitations mean that cost-effectiveness must be balanced with high quality medical care. Public pressure, exerted on hospitals via political structures, often determines which aspect of quality is emphasised. Multiple stakeholder groups thus have an interest in looking at EC metrics but will have different perspectives on the importance of various indicators in evaluating quality care. Managers need to be accountable, and therefore transparent to the political structures, the population and their staff and would view quality in terms of efficiencies of resource use such as bed usage and equipment availability. Patients' concerns are often around how they are treated as human beings e.g. waiting times, relief of symptoms, politeness and communication. Clinicians are concerned about optimal clinical care, improvements in clinical care, outcomes of particular treatments and patient safety, thus are interested in more technical aspects of care, such as staff competence and patient outcomes. With advances in evidence based medicine and increasingly defined standards of care, monitoring of clinical care is becoming more necessary. Hard data, in the form of indicators, can help managers and clinicians, determine priorities and guide resource allocation. (11)

"Bench-marking" refers to setting a particular standard coupled with a measuring tool with the aim of maintaining and improving management, clinical and logistic services. Standardisation across healthcare facilities allows comparison and consequent collaboration between facilities. (12) These metrics are generally set by

regulatory bodies with collaboration with stakeholders such as clinicians, and are variously referred to as quality or performance indicators, measures or metrics. Considering the multiple stakeholders interested in these metrics, and their differing perspectives, one should be very clear of the purpose of the measurement and that the measure is appropriate for this. Each healthcare facility has distinct characteristics because of all the complexities involved in healthcare – such as patient characteristics, geographic location, staff mix, resources, scope of practice and many more. Whilst there are minimum expected quality standards, the emphasis on targets must be tailored to a point to the particular context in which they are applied. (13) Regardless of perspective, these should be used to achieve set evidence-based standards of care, maintain these and drive improvements, as well as provide transparent accountability to patients.

Evidence shows that measuring performance is an important tool to improve care. Data-driven quality improvement programs have been shown to be successful. (3,14–16) A 1999 Harvard Quality Study reviewed five teaching hospitals and looked at compliance to process-of-care guidelines for six particular presenting complaints. (6) Benchmark measures looking at quality care, from a patient's perspective, were administered in the form of a questionnaire. These were reported across the facilities. Guided by these reports, the facilities designed quality improvement projects to improve adherence with guidelines (from 55.9% to 60.4%). (6) Post-intervention, there was an improvement in satisfaction of care. They concluded that benchmarking for comparison across facilities and collaboration in improvement had value with respect to quality improvement. (6)

The Donabedian framework for measures for quality care divides measures into structure, outcomes and process measures. (5,13,17) In addition, quality indicators now also look at patient-satisfaction, and equity of care. Measures of structure are the elements that must be in place to set up a functioning service – the organisational factors. Measures include physical items such as infrastructure, layout, equipment, protocols and staff characteristics (number, skills mix and teamwork). Good organisational factors are critical to provide care, but do not in themselves guarantee quality care. These are generally not measured as performance indicators but rather to set infrastructural and organisational standards for ECs. Outcome measures can be described as the consequences of care. Outcomes are affected by multiple factors, including both structure and processes. Measures include health status such as morbidity and mortality and patient satisfaction. Process measures refer to the steps involved in the patient care

process that would then lead to an outcome. For example, the time taken before a patient is given analgesia is a process measure which would then relate to the outcome of pain relief and satisfaction for the patient. (5,13,18–20)

Measuring quality in emergency care

Whilst it is ideal to look at outcomes measures, this is challenging in the EM setting for several reasons. Patients present with acute symptom complexes, and a final diagnosis may not be made during the EC stay but rather further along in the patient journey. Furthermore, the follow-up does not occur in the EC and feedback to EC rarely happens. Measuring quality by outcome measures in the EC setting is challenging in that hard clinical outcomes such as mortality and morbidity can only be measured at the end of the patient journey. Singling the EC portion of this journey out is difficult to do. The relationship between care and outcomes is not always linear, especially in an EM setting, as the EC encounter is one episode along the continuum that is the patient's journey. Care of the patient continues in the community for discharged patients and in a ward environment for admitted patients. This makes it difficult to relate EM care to outcomes which occur after the patient has left the EC. Outcomes are often related to particular conditions, with outcome measures specific to those. There has been an interest in developing condition-related outcome indicators in EM, however this is difficult to do in ECs. ECs see a wide-range of clinical conditions, thus linking conditions to quality would result in a huge number of indicators to measure and consequently demanding a big outlay in terms of time resources in gathering and analysing the data. Severity, acuity, length of illness and comorbidities are some of the many variables, and outcomes need to be adjusted for these factors. Most outcome-based assessments are clouded by complexity of multiple case-mixes and the involvement of serial service platform levels as well as specialty departments. (21,22)

Process measures generally relate to events occurring in the EC, so the interactions between patients and the hospital environment. This entails both expert, evidence-based clinical care and inter-personal interactions, such as communication and empathy, with patients. Because these measures relate to occurrences in the EC, and thus under the control of the EC to measure and change, they are most often used as quality improvement measures in EM. Since these are proxies for outcome, it is essential that these process measures can be shown to result in good outcomes. Process measures can relate to a particular condition – such as time to the catheter-laboratory in myocardial infarction or to more general processes such

as maintenance of equipment or time from arrival to health care provider. This approach has been adopted by many international EM organisations, including the International Federation of Emergency Medicine (IFEM). (19,20)

EM is heavily process-driven and many of these processes are time-based, thus many of the process measures used in EM are related to time to management or waiting times. In terms of quality health care, timeliness means “reducing waits and sometimes harmful delays for both those who receive and who give care”. (2) Looking at how EC’s function, the focus on process-based measures, and particularly time-based, makes sense. Since by definition, the doors of an EC must remain open to all-comers, it is essential that the disposition pathway be streamlined. (19) EM has been described as a time-sensitive specialty. Although prehospital systems are expanding to more definitive care at first contact with the patient, in many places ECs remain the portal of entry to the hospital for urgent and emergency conditions and the first opportunity for life-saving intervention.

Time-driven emergency care

Evidence-based guidelines stress time-sensitivity in many clinical conditions to maximise patient care and comfort and optimise clinical outcomes. The consensus in the Surviving Sepsis Campaign continues to recommend time-based interventions in severe sepsis and septic shock as a foundation in improved outcomes. Early recognition and prompt initiation of management in sepsis is emphasised. Interventions are administered as bundles of care during the first 6 hours of care. This includes broad-spectrum antibiotic administration within one hour. Similar early antibiotic recommendations are given in guidelines for management of specific infections, such as pneumonia. (23–28) Delays in time to reperfusion in ST-elevation myocardial infarction (STEMI) has been associated with increased morbidity and mortality. The American Heart Association recommends that time to reperfusion in STEMI not exceed 30 minutes for thrombolysis or 90 minutes to primary percutaneous coronary intervention. (29–32) Time has also been shown to be critical in ischaemia stroke. The American Stroke Association recommends reperfusion strategies in acute ischaemic stroke within 60 minutes of arrival, which necessitates a clinical evaluation and imaging before to rule out haemorrhage. (33–35)

Triage is the process where patients are sorted into categories of severity to determine the priority in which waiting patients should be seen. Triage tools are

derived based on outcomes for time taken to see categories of clinical severity. The South African Triage Scale (SATS) is a local version of a triage system developed for resource-constrained settings. It is a two-tiered system which uses discriminating criteria (such as chest pain or severe mechanism of injury) coupled with a physiological score. The system is colour coded, with four levels of priority – emergency (red), very urgent (orange), urgent (yellow) and non-urgent (green). Time recommendations to be seen by a health care provider (HCP) are attached to each triage category. The SATS is predominantly a nurse-led triage system. (36–40) Introduction of SATS in a public hospital in the Western Cape reduced waiting times in the red, orange and yellow categories significantly and resulted in a significant overall reduction in waiting times from 237 minutes to 146 minutes ($p<0.001$), with the greatest benefit in the red category. (41) Consequently, there was also a significant decrease in mortality in the EC. (42)

Overcrowding in ECs and long EC boarding times have been directly linked to poorer outcomes, increased mortality and poor patient care. Delays in transfer greater than six hours for the sickest patients from EC to the intensive care unit (ICU) have especially been shown to have higher mortality and protracted ICU stays. (43) Other consequences of overcrowding are long waiting times to be seen, long lengths of stay in the EC, high numbers of patients leaving without being seen and decreased patient satisfaction. (44–53) Overcrowding results from a mismatch in supply and demand of resources and need. This is a complex balance. Conceptually, this can be understood as patients flow through the EC. This has three components. Input is the amount and types of care sought in the EC; throughput looks at the processes of care within the EC, such as assessment, management and decision-making; and output is the movement of patients out of the EC to another care site, which may be transfer, discharge or admission. A major contribution to EC overcrowding is “access block” – the situation where patients who have been admitted to an inpatient bed remain in the EC while awaiting an inpatient bed (EC boarders), usually due to lack of available inpatient beds. Measures reflecting EC boarding time are useful to monitor, in order to alert the hospital as a whole to strive to improve patient flow; however, freeing up inpatient beds is beyond the mandate of the EC. Data from the EC provide firm scientific evidence to spur the whole hospital to improve patient flow. The throughput time is also a major contributor to EC overcrowding, and since this measures EC performance, is useful as a performance measure for the EC itself. (54) The throughput time has a number of stages which can be looked at

individually, such as time to triage and time to HCP. All the stages of care, such as management, decision-making and dispositions should be efficient and timely. The time for making management decisions can be influenced by factors such as laboratory and radiology turn-around times. Morbidity and mortality benefits have been seen when the total time spent in an EC is reduced, resulting in decreased EC overcrowding. (52) Casalino, et al. suggest that EC overcrowding is a serious problem for ECs the world over, with between 10-74% of surveyed hospitals reporting this as a problem in various studies in the USA and Australia. (55) A 2012 audit in Western Cape hospital ECs showed EC occupancy averages at about 112% and access block at 45%. (personal communication, Dr Heather Tuffin, Western Cape Department of Health, 12/06/2016) Given the serious impact of overcrowding on outcomes and quality care, consensus studies have looked at metrics to measure EC overcrowding. Process time-measures were amongst the top identified measures for EC overcrowding, particularly time from admission to ward transfer; however, other time measures looking at EC flow in-through-out were also considered relevant because of their contribution to overcrowding. (55–60)

Patients expect timely management of their condition, and waiting times are a source of much of patient complaints. Patient experience is negatively impacted by factors such as long waiting times, lack of communication and no timely relief of symptoms such as pain or nausea. (60–67) Thus, waiting times are huge focus in terms of patient satisfaction and patient-centered care. It has been noted that communication of accurate waiting times improves patient satisfaction, by reducing perceived waiting time. Thus, if ECs know their waiting times, by measuring them, this would partially help this issue. (68) In addition to patient dissatisfaction, long waiting times increase the possibility that a patient's condition could worsen during their wait or the patient may leave without being seen – with consequences on outcomes, as well as medico-legal implications. (69–72) Although the patients who leave without being seen are generally considered of low acuity, various studies show that between 1-11% of self-discharging patients required admission shortly after their visit. (73)

Performance quality indicators in emergency care

Developing good clinical performance indicators which reflect quality of care in EM is an ongoing process world-wide. (55,74–76) An indicator must be both useful and feasible. To be effective in for quality improvement and standard of care benchmarking, a performance indicator should be reliable and valid. Jones, et al.

defined a quality indicator as “a measurable element of practice performance, for which there is evidence or consensus that it can be used to assess the quality, and hence the change in quality, of care provided”. (77) Criteria for a good quality indicator are listed below:

- A reliable indicator gives replicable results.
- A valid indicator reflects performance, in that it relates directly to relevant clinical outcomes, through an evidence base.
- A responsive indicator can detect changes in performance, be they good or bad, for mitigation or improvement to be made.
- For collaboration across facilities, the indicator should lend itself to making comparisons, which necessitates an explicit definition so that there is consistency in measurement. This requires an operational definition; numerator and denominator; data elements required; sources for data and risk adjustment if needed.
- Practically, since resources are needed to collect and analyse data, an indicator should be feasible to measure.
- The indicator must be acceptable to the clinical staff that is using it, in that they see value to the indicator, otherwise there will be non-compliance.

Encompassing all the criterion above, Jones, et al., in 2014, developed a quality indicator appraisal (QICA) tool to guide EM indicator selection. (77)

Evidence based quality

As mentioned earlier, many currently used EM quality indicators are time-based process measures. Lindsay, et al. applied a systematic method to develop valid, relevant and feasible performance indicators in 2002. (78) They conducted a modified-Delphi study consulting an expert panel. These indicators were based on condition-outcome pairing. Several of these indicators were time-based: such as time to initial ECG in chest pain patients and time to reperfusion in myocardial infarction. (78) A similar study was conducted in the UK in 2004. (79) A significant number of the indicators judged to be good indicators of quality of care were time-based. Many of these were coupled with specific conditions or presenting complaints, such as chest pain, trauma or asthma. (79) Two examples are: time to analgesia with a clinical fracture, and time to antipyretic in pyrexial children. (79) More recently, the Canadian Institute for Evaluative Sciences (2010), reviewed the

literature with respect to quality indicators and used a modified Delphi process to review these, based on scientific validity and relevance. (80) Indicators that were relevant to a broad base of patients and conditions were considered the highest priority. Amongst these were again many time-based measures: EC length of stay, time to analgesia, time to reperfusion for MI and stroke and time to antibiotics. (80) In Ireland, in 2013, a similar Delphi process rated some time-based indicators as top 6. (81) These were: time from arrival to first ECG in suspected cardiac chest pain, time to antibiotics in children with suspected bacterial meningitis and time to administration of analgesia in children with forearm fractures. (81) A 2016 Delphi process conducted in Denmark, resulted in the selection a set of nine quality indicators. (82) Of these, seven were time-based. These were: timeliness of treatment for stroke and STEMI, time to theatre for patients with suspected gastrointestinal perforation, time to wrist x-ray, timeliness of hemodynamic stabilization of acute gastrointestinal bleeding, time to triage, and time to specialist consultation. (82) A Scandinavian study, in 2013, evaluated the consensus on recommended performance measures, in the USA, UK, Sweden and Canada, via systematic review. In total, 55 performance measures were identified. (83) The ED time intervals were the measures most recommended, in particular: length of stay, time from arrival to clinical assessment and time from arrival to admission. (83) And finally, Madsen, et al. in 2015, conducted a systematic review to evaluate the level of evidence for EM performance indicators. (84) It was concluded that generally the level of evidence for emergency indicators was low but that this may be partly due to the lack of research in this area. (84) Again, amongst the highest rated indicators, were time to treatment and EC length of stay. (84) It was noted that time-based measures are relatively accessible in terms of data collection from electronic systems already in use, making them feasible in many places. (84)

Much of the literature around indicator selection and evidence is conducted in well-resourced settings where sophisticated technology and clerical capacity allow for easier data gathering and analysis. These settings also have more advanced quality assurance and improvement systems. In poorer-resourced settings, feasibility of the indicator becomes more important. A systematic review of indicators used in resource-limited settings was conducted in 2015. (85) This included countries such as Nigeria, Uganda, South Africa, Malaysia, Brazil, Guyana, India, Pakistan, Kenya, China, and Botswana. 40% of indicators were process time-based, possibly because of the easier availability of the data. (85)

The International Federation of Emergency Medicine (IFEM) has developed a quality and safety framework. (19) Integral to this is a set of proposed indicators to measure quality. Since quality is multi-dimensional – incorporating all the dimensions of safety, timeliness, effectiveness, equity, efficiency and patient-centeredness – each of these aspects should be seen in the context of the whole system. It is recommended that a balanced set of indicators (or a family of measures) be used to represent all these aspects. (19) Using an indicator focused on a single aspect of quality, such as timeliness, can result in improvements in one quality aspect only, to the detriment of others such as safety or effectiveness, thus improving the metric number but not driving quality as a whole. When one particular metric is concentrated on for improvement, the other key metrics must be monitored for changes, which may be positive or negative. (86–88) This is especially likely if organisations are ranked based on a narrow set of indicators and especially if these are linked to pay-for-performance systems. (13,14,18,21,76,89) Within the balanced quality framework, time-based measures are one aspect of quality and continue to be an important one. The IFEM recommends a number of time-based measures, again looking at time to treatment for various conditions as well as process times for each stage of the EC journey. (20)

Internationally, use and targets for time-based process indicators vary amongst countries. Viberg, et al. conducted a study in 2012 looking at EC waiting times comparatively across 23 Organisation for Economic Co-Operation and Development (OECD) countries. Of these, 15 countries monitor and publish waiting times aligned to targets. Waiting times for elective surgery were more commonly measured than EC waiting times – the latter more likely to be measured in countries with a more developed emergency medicine specialty. It was noted that there were significant differences between countries in terms of how waiting times were defined and measured, making comparisons difficult. (90) An Australasian study in 2014 also found wide variation in how waiting times were measured. (91) Differences in case-mix, patient volume, resources and local systems between facilities creates further difficulties in making comparisons. (92–97)

The UK, Australia and more recently the USA, set targets for total length of stay in the EC from time of arrival to time of departure (either discharge, admission or transfer). (55,98) The National Health System (NHS) in the UK, set a 4 hour EC length of stay performance target in 2000, aimed in part to improve a patient's experience of the EC. The target is that 95% of patients must be seen, treated and admitted or discharged from the EC within 4 hours. There has been much criticism

of this policy amidst concerns of data manipulation, narrow attention on times to the detriment of other aspects of quality, and the concern that overall outcomes are not affected. (88,99,100) That said, there is suggestion that this indicator has led to increased awareness of systems and especially patient flow, with an emphasis on whole hospital collaboration for quality improvement. (88) The NHS has subsequently developed a more comprehensive family of measures. (101) Current NHS EC performance, as measured by the 4-hour target, as well as interval time-measures, is published in an annual report. The 2014/15 data are as follow:(102)

- Time of arrival to initial assessment:
- More than 50% within 10 minutes
- 90% within an hour
- Mean average duration to assessment was 43 minutes
- Median value was 10 minutes.
- Time of arrival to treatment
- More than 50% within an hour of arrival
- 90% within 150 minutes of arrival
- Mean average duration 76 minutes
- Median value was 54 minutes
- Time of arrival to departure
- More than 50% within 2 hours 20 minutes of arrival
- 91.5% within four hours of arrival.
- Mean average duration to departure was 154 minutes
- Median value was 134 minutes.

The Australasian College of Emergency Medicine (ACEM) published quality standards for ECs in 2015. (103) This is a comprehensive framework of which the clinical domain is one aspect, described as “the patient care pathway through the EC, from first communication with the EC to admission, discharge or transfer”.(103) The importance of timely care and time frames are emphasised a number of times along the patient pathway, in that “Patients who present to the EC receive care as soon as is required and is practicable”.(103) Initiation of care

should fall within time frames according to the Australasian Triage Score: Resuscitation: Immediate; Emergency: 10 min; Urgent: 30 min; Semi-urgent: 60 min; Non-urgent: 120 min. (104) The Emergency category includes conditions where a time-critical intervention significantly affects outcome, such as reperfusion or antidotes. (104) It is further recommended that those waiting for treatment are given first aid and symptomatic treatment such as analgesia. Once the decision is taken for a patient's admission, the patient should be transferred to the ward within one hour, as long as the patient's care is not compromised. (104) The time-frames do not stand alone, rather they are coupled with other quality measures such as safety and effective care. A national access target where 90% of EC presentations must be completed within 4 hours of arrival, was recently been proposed in Australia. This corresponds to an EC length of stay, calculated from time of presentation to the EC and physical departure. Figures from 2014 to 2015 are as follow: (104)

- 74% of patients were seen within recommended triage times
- Almost 100% of Resuscitation
- 79% of Emergency
- 68% For Urgent
- 74% For Semi-urgent
- 92% Non-urgent patients
- The median waiting time from arrival to being seen was 18 minutes
- Proportion of all EC visits completed in less than four hours was 73%. (NHA performance indicator)
- Proportion of admitted patients transferred to ward within four hours was 47%, and 90% were admitted within 11 hours and 41 minutes.
- Generally, treatment times were longer for patients subsequently admitted to the hospital than for other patients.
- The median length of stay in the EC for all-comers was 2 hours and 41 min. For patients who were admitted, this time was longer: four hours 16 min as compared to those discharged: two hours 8 min.
- Patients with higher triage categories, therefore requiring more urgent treatment, were less likely to have their treatment completed within four

hours: 57% for resuscitation and emergency cases as compared to 81% for semi-urgent and 93% for non-urgent.

In the USA, some time-based EC indicators are in use. Amongst these are median times from arrival to departure for admitted and discharged patients, admit decision time to departure time for admitted patients and EC wait time (or time from arrival to health care provider). (105) Waiting time data for the USA were released by the Center for Disease Control (CDC) in 2010-11, showing data from National Hospital Ambulatory Medical Care Survey, United States. The median waiting time from arrival to seeing a health care provider was 30 minutes. The median waiting time for the highest acuity triage category was 12 minutes. The median treatment time was 90 minutes. Treatment times were longer for patients who were triaged as immediate, emergent, and urgent versus triaged semi-urgent or non-urgent. (Figure 1) (106)

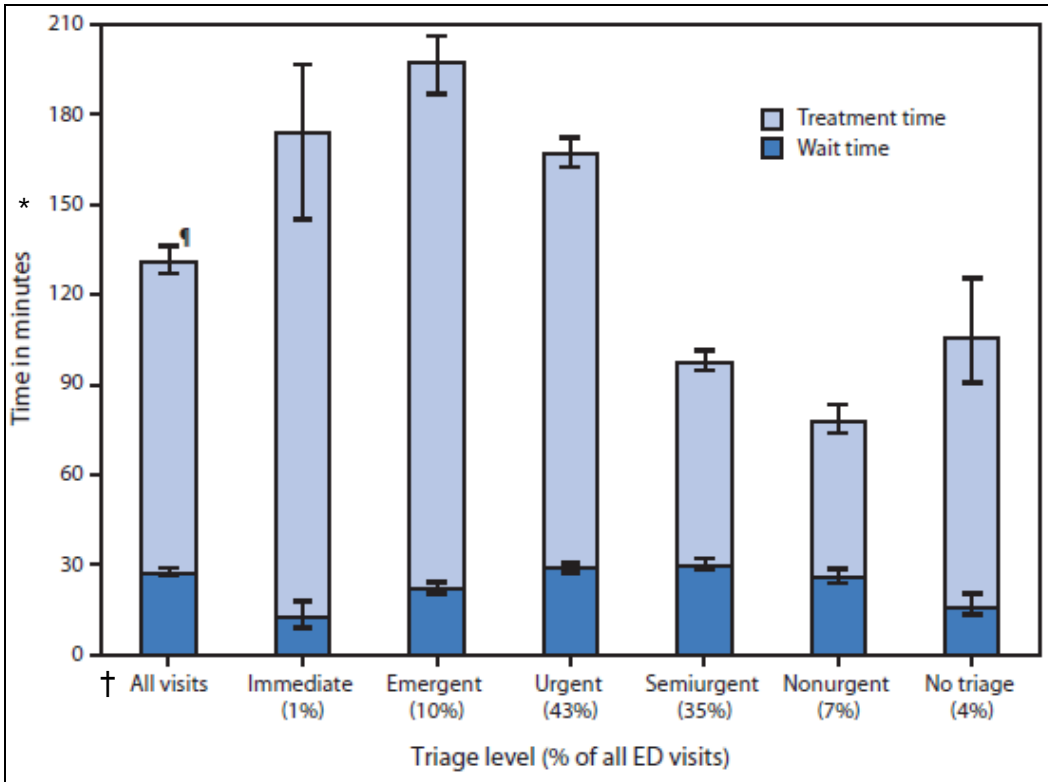

Figure 1: Median Emergency Department Wait and Treatment Times National Hospital Ambulatory Medical Care Survey, United States, 2010–2011[§] (source: Centers for Disease Control and Prevention. Morbidity and Mortality Weekly Repost. 2014)

* Wait time was defined as the difference between the time of arrival in the ED and the time the patient had initial contact with a physician, physician assistant, or nurse practitioner. Treatment time was defined as the difference between the time the patient had initial contact with a physician, physician assistant, or nurse practitioner and the time the patient was discharged from the ED to another hospital unit or to the patient's residence.

† Triage level was based on a five-point scale: 1 = immediate, 2 = emergent, 3 = urgent, 4 = semi-urgent, and 5 = non-urgent. No triage was defined as a visit to an emergency service area that did not conduct nursing triage. Triage level was imputed for 19.5% of records included in this analysis. Emergency service areas using three or four level triage systems had their responses rescaled to fit the five-level system. In 2010 and 2011, rescaling was required for approximately 12.0% of records.

§ Estimates are based on 2-year annual averages. Approximately 16.9% of records were excluded from this analysis for the following reasons: patient not seen by a physician, physician assistant, or nurse practitioner; record missing wait or length of visit times; treatment time = 0; or disposition of left after triage, left against medical advice, transferred, or dead on arrival.

¶ 95% confidence interval.

The Institute for Clinical Evaluative Sciences (ICES) based in Canada, developed a consensus on KPI's that they recommend for Canadian ECs. Of the nine most highly recommended measures, the top indicator was EC length of stay, defined as time from first documented contact in the EC until leaving the EC, measured for all-comers and then by triage acuity. (80) According to a 2010-11 report by the Canadian Institute for Health Information (107), EC waiting times were longer than the Canadian Association of Emergency Physicians recommended target times. They were as follows:

- Overall average length of stay in EC 4.4 hours
- 90% of EC visits were completed within eight hours
- Admitted patients stayed longer in the EC than those discharged
- Patients with more serious conditions stayed longest in the EC
- Median waiting time to be seen for Immediate triage category (recommended time less than five min): 11 min
- Median waiting time to be seen for Emergent triage category (recommended time less than 15 min): 54 min
- Median waiting time to be seen for Urgent triage category (recommended time less than 30 min): 79 min
- Median waiting time to be seen for Less Urgent triage category (recommended time less than 60 min): 66 min
- Median waiting time to be seen for Non-Urgent triage category (recommended time less than 120 min): 53 min

Locally, a Delphi study conducted in South Africa in 2010 reported that the clear majority of feasible and useful indicators in EM are either structure or process

based. (108) Only one outcomes-based indicator was found to be acceptable: number of missed injuries discovered after leaving the EC. (108) Of the process measures, many were time-based. Some of time-based indicators identified were like the previous Delphi studies, in that they focused on particular conditions (such as trauma or pneumonia) and interventions (such time to antibiotics or thrombolysis). (108) There was an additional focus on time-based measures looking at the whole patient journey through the EC. These measures were set as portions of the total EC patient journey to get a clearer representation of the times of the different processes associated with each journey step. (108) The EC patient journey was conceptualised as an in-through-out patient journey, with time based measures associated with each stage. These times are:

- Total time in the EC
- Time from arrival to triage
- Time from triage to being seen by doctor
- Time of arrival EC to discharge
- Adherence to target times of the South African Triage Group

A South African perspective on quality measurement

The National Core Standards (NCS) were developed by the South African National Health Department to define a benchmark for assessing and monitoring quality care across the healthcare system. These are minimum expected safety standards based on international standards and best practice. An Office of Health Standards Compliance (OHSC) was established to develop the NCS, as well as an audit tool to assess compliance of health facilities to these standards. Ultimately, the exercise is to assess strengths and gaps in the current health system to inform planning and improvement for the envisioned universal health coverage plan, the National Health Insurance (NHI). An audit was conducted from May 2011 – May 2012, by a designated consortium, to assess infrastructure, classification of facilities, human resources, services offered, location and compliance to priority areas of quality. The NCS quality framework formed the basis of the audit. The audit was done in two parts. The first, a self-assessment questionnaire completed by the facility manager. The next, an audit completed by a trained audit team at the facility itself. A team leader monitored methodology and quality checks of the team. The data was then validated, then captured electronically for reporting. There were limitations to the

study. Some information was self-reported and may be prone to bias. It is acknowledged that cleaning and validation of the data is not yet complete. The baseline audit covered six predefined quality priority areas, emphasizing patient-centered care, with waiting times reflected here:

- Value and attitudes of staff
- Cleanliness
- Waiting times
- Patient safety and security
- Infection prevention and control
- Basic medicines and supplies

Waiting times were not measured as numerical scores, but rather the emphasis was on reducing delays in care by ensuring that systems are in place to manage and track queues. It is noted that the criteria include the monitoring of waiting times – i.e. some system of waiting time indicator measure, and that patients are managed according to the severity of their health condition i.e. a functional triage system is in place. (109) Although waiting times had the highest average compliance score of the six priority areas, across all facilities country-wide, the score was only 68%. The score in the Western Cape Province was 69% (Figure 2). (109) Clearly a lot more work needs to be done in defining indicators and monitoring quality healthcare, including waiting time metrics.

In line with the NCS and international standards, the Western Cape Department of Health (DOH) has set time-based targets as part of the provincial EC Annual Operational Measures in 2012. The strategy of the Department is engendered in the document Healthcare 2030. A culture of continuous improvement is envisioned, with indicators and targets defined to monitor and improvements in quality care and provide accountability. Quality is conceptualised as the Institute of Medicine (IOM) framework, with the six components. (1) Each discipline was responsible to define quality indicators for the annual operational plans. The 2014-2015 indicators and targets that were used are tabled below. For EM, in addition to metrics for accuracy of triage, and completeness of documentation, waiting times were proposed. These times are related to the various stages of a patient journey through the EC. Since there is no current information technology system that records these metrics, a folder audit had to be done. The waiting time audit tool was developed as a means

to measure these indicators from information in the folder audits. Table 1 details the EC key indicator definitions. (Addendum 2: Circular H33 of 2012: SOP: Emergency Centre Waiting Time Audit)

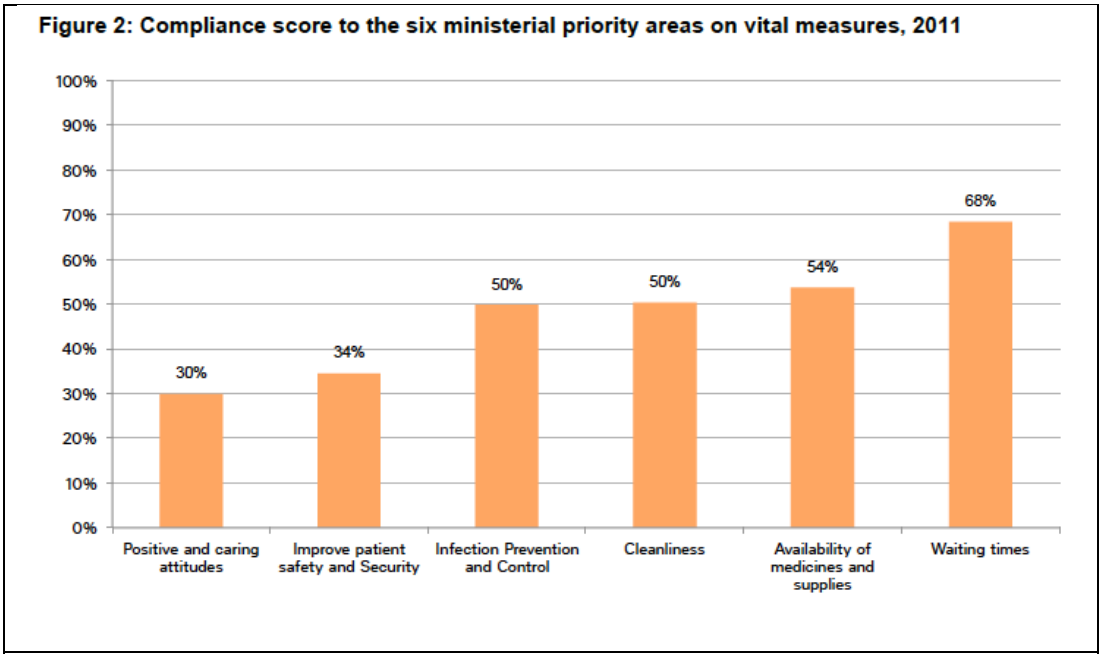

Figure 2: Compliance score of the six ministerial priority areas on vital measures, 2011 (source: Department of Health. The National Health Care Facilities Baseline Audit: National Summary Report. 2013)

Table 1: Emergency centre key performance indicator definitions

Indicator	**Definition of Numerator**	**Definition of Denominator**	**Type of Indicator**	**Target for 2014/15**
Percentage of patients correctly triaged as per SATS	Number of patients in the sample correctly triaged	Total number of patients surveyed in the sample for correct triaging	Percentage	80%
Improved ambulance turnaround time	Turn-around time is measured from arrival of the ambulance at	None	Number of minutes	< 20 min

	the at hospital until free to attend to another call			
Time from arrival to SHCP seeing the patient per triage colour as per SATS	Number of patients seen within recommended SATS time per triage category	Total number of patients seen per triage category	Percentage	80% Red immediately 80% Orange within 10 min, 50% Yellow within 1 hour, 50% Green within 4 hours
Time from SHCP to disposition decision	Number of patients seen by SHCP and decision made within 6 hours	Total number of patients seen and attended to in the EC	Percentage	80% within 6 hours
Time from decision-to-admit to ward entry	Number of patients admitted to ward within 6 hours of referral	Total number of patients referred for admission from the EC	Percentage	80% within 6 hours
Percentage of folders audited with complete information on required times. (folder audit)	Number of folders with complete times noted: arrival, triage, seen by SHCP and disposition decision	Total number of patients seen and attended to in the EC	Percentage	85% with complete documentation
Percentage of EC patients discharged	Number of patients discharged from the	Total number of patients separated from the	Percentage	100% of sample/surveyed cases

from the observation ward with an ICD-10 code	observation ward with ICD-10 code on hospital information system	observation ward		
SHCP, Senior HealthCare Provider; SATS, South African Triage Scale; ICD-10, International Statistical Classification of Diseases-10.				

Conclusion and recommendations

It is increasingly clear that quality in emergency medicine should be standardized and monitored to ensure good clinical outcomes and prudent use of resources. The literature supports the use of metrics for setting standards and monitoring quality for improvement. Whilst research and discussion is ongoing, and there is much variation in definitions and methods of measuring EM KPIs, there is a consensus that EM KPIs should be a family of measures covering all the domains of quality. In EM, because of the unique clinical environment, many of the currently accepted measures are process-based measures which serve as proxies for outcomes, whilst some are time-based measures. It is acknowledged that there is poor evidence that many of the measures relate closely to outcomes and research continues in this area. Currently, most international EM quality systems use several time-based KPIs, relating to both time for critical therapeutic interventions and waiting times for patient assessment, management and disposition. The Western Cape Government Department of Health has adopted time-based process measures as part of the EM KPIs and devised a monitoring tool to accompany this. Intermittent audits have been conducted to track these in the Western Cape but these have not been published thus far. No formal regular audit process is in place either. Nationally, although waiting times are considered an integral part of quality, there is no formal method to define and monitor these yet.

There is a need to review and interrogate the current waiting times as per the audits performed by the Western Cape Department of Health. Following this, a process should be followed to further define appropriate KPIs for EM, and a method for these to be monitored in a more regular and standardized way devised. Following this, these measures should be rolled out comprehensively to ECs nationally.

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Part B: Manuscript in Article Format

Title page

Describing key performance indicators with respect to waiting times within Western Cape Emergency Centres between 2013 and 2014

Authors:

Dr Kirsten Cohen, Emergency Medicine Specialist, Emergency Centre, New Somerset Hospital, Cape Town, South Africa

Dr Stevan Bruijns, Senior lecturer, Division of Emergency Medicine, University of Cape Town, Cape Town, South Africa

Corresponding author:

Dr Kirsten Cohen: kirstenlcohen@gmail.com

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Abstract

Background

Data, measured as Key Performance Indicators (KPIs), are used internationally in emergency medicine to measure and monitor quality of care. The Western Cape Department of Health introduced time-based KPIs for Emergency Centres (ECs) in 2012. This paper describes the most recently processed results of the audits conducted in Western Cape ECs between 2013 and 2014.

Methods

A retrospective, descriptive study was conducted on data collected in the six-monthly Western Cape, Emergency Center (EC) triage and waiting time audits for 2013-2014. Time variables were analysed overall and per triage category. ECs from hospitals were compared to ECs from Community Health Centers (CHCs). A descriptive analysis of the sample was undertaken. Proportions for categorical data are presented throughout. The continuous variable time was described using mean and standard deviation. The Chi^2 and Fisher exact was used to describe associations. Significance was described as a p-value <0.05 and the 95% confidence interval where appropriate.

Results

There was no significant difference for the triage acuity proportions between hospital and CHC ECs. Waiting times were longer than recommended by the South Africa Triage Scale, however, higher acuity patients were seen faster than lower acuity patients. Waiting times were significantly longer at hospitals compared to CHCs. A red priority patient presenting to a CHC would take 6.1 times longer to reach definitive care than if the patient presented to the hospital EC.

Conclusion

The triage process appears to improve waiting times for the sickest patients although protracted throughout. Acutely ill patient journeys starting at CHC ECs suggested significant delays in care. Models need to be explored that allow appropriate care at first point of contact and rapid transfer if needed. To improve waiting times, resource allocation will need reconsidering within the emergency care setting.

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Introduction

Health systems globally are under pressure from growing populations, increasing medical costs and increasing patient expectations. Resource limitations dictate that high-quality care must be balanced with cost-effectiveness. (1,2) Data, in the form of Key Performance Indicators (KPIs), are used in Emergency Medicine (EM) to measure and monitor quality of care. This helps both managers and clinicians determine priorities, guide resource allocation and improve quality of care. Quality healthcare can be defined as ‘‘the degree to which health services for individuals and populations increase the likelihood of desired health outcomes, and are consistent with current professional knowledge.’’ (3) Patients may not be informed judges of the technical aspects of quality medical care, but have expectations related to the service aspect. (4) Thus, we see that quality healthcare is multi-faceted.

The doors of an Emergency Centre (EC) remain open at all times, to all-comers and therefore it is essential that the patient’s journey through the EC be streamlined. Management, decision-making and disposition should be efficient and timely, with the result that emergency medicine needs to be heavily process-driven. Measuring hard clinical outcomes such as mortality and morbidity in the EC setting is challenging in that these can only be measured at the end of the patient journey; singling the EC portion of this journey is difficult, because of the involvement of different service platforms and other speciality departments. (5,6) The Western Cape Department of Health has adopted the Institute of Medicine’s framework to conceptualise quality healthcare, where quality is considered in the following domains: safety, effectiveness, patient-centred, timely, efficient, equitable and sustainable. (1)

Performance indicators are one way of measuring quality in the EC. These can be structure, process, or outcomes based: structure-based indicators relate to resources needed to run a service such as infrastructure and staffing, process indicators relate to the activities which are involved in managing patients, and outcome indicators measure the outcome after management of the individual (4). Most EM KPIs are process based, serving as proxies to hard clinical outcomes. (3,7,8) A Delphi study (conducted in South Africa in 2010) confirmed that most feasible and useful KPIs in emergency medicine are either structure or process

based, with a fair portion listed as time-based KPIs. (9) The International Federation of Emergency Medicine in 2014 also suggested that time-based process measures was an important determinant of a quality framework. (10) In terms of quality health care, timeliness essentially translates to acceptable waiting times for assessment, management and disposition of patients, to avoid harm from delayed care as well as patient discomfort. It has been shown that timely triage saves lives; the measures of time from arrival to triage, triage to healthcare professional, EC to ward for admitted patients and overcrowding correlate with mortality outcomes. (11–16) Elsewhere, evidence-based guidelines stress time-sensitivity in many emergency clinical conditions, e.g. time to antibiotics and fluids, time to thrombolysis and time to analgesia. (17–20) Moreover, patients expect timely management of their condition. Internationally there is a major emphasis on waiting times, specifically related to the various stages of the patient journey through the EC. (8,10,21–23)

Measuring waiting times is not routine practice in most South African hospitals. A Delphi study conducted in South Africa in 2010 adopted waiting times as an EC quality measure. (9) The Western Cape Department of Health introduced time-based KPIs for the EC in 2012 as part of their provincial annual operational measures. These measures were set to represent different portions of the EC patient journey, in order to get a clear representation of the times involved at each step. These were: time from arrival to triage, time from triage to health care provider, time from health care provider to disposition decision and time from disposition decision to leaving the EC. Dedicated waiting time audit templates were developed along these KPIs. This paper describes the most recently processed results of all these bi-annual triage and waiting time audits, as conducted in the Western Cape ECs between 2013 and 2014.

Methods

A retrospective, descriptive study was conducted on data collected as part of the six-monthly Western Cape, EC triage audits conducted at healthcare facilities with 24-hour ECs in the province for the years 2013 and 2014. Audits were performed at central regional and district hospital ECs, as well as 24-hour Community Health Centres (CHCs) ECs. District hospitals tend to provide generalist services (mainly operated through family medicine) at a secondary care level. In addition to the generalist services provided by district hospitals, regional hospitals provide general specialist care, whilst central (or tertiary) hospitals provide sub-specialist care in

addition to general specialist care. The CHCs are essentially 24-hour primary care facilities and although they have dedicated ECs, there are no inpatient services. The healthcare provider depends on the level of healthcare facility and may be a doctor or a clinical nurse practitioner.

An audit starts by including 100 random patient folders obtained from the preceding month at a single facility EC (collection 1). The selection is made by the ward clerk and randomisation is therefore not consistent. This is then sorted into triage categories (red, orange, yellow and green) by a senior clinician or a lead triage nurse working in the EC, and supplemented by additional folders until all four triage categories contain a minimum of 30 cases (collection 2). As a result, audits often contained in excess of the required minimum of 120 cases. Each clinical record is then evaluated by the senior clinician or a lead triage nurse for triage accuracy. In addition, arrival time, triage time, first healthcare provider's consultation time, referral time and disposition time are extracted. The time-related variables are collected where present in the clinical record, providing an indirect reflection of record keeping. Patient identifiable data are not collected by the audit. Data are then transcribed onto a dedicated, electronic audit template. The audit is then submitted to the general specialist head for EM, whom analyses the data and provides feedback to the various facilities. Audit data are stored in a database which is registered with the Human Research Ethics Committee of the University of Cape Town (R056/2014). Permission was obtained from the committee to analyse the data for this study.

A descriptive analysis of the sample was undertaken; the continuous variable time, was described using mean and standard deviation (SD). Proportions for categorical data are presented throughout. The triage category breakdown for each facility was derived from the initial collection of 100 folders (collection 1). Collection 2 was used for the rest of the calculations. Time variables were analysed overall and per triage category, and the ECs from hospitals were compared to the ECs from CHCs. The Chi^2 and Fisher exact test (depending on group sizes) were used to compare different categorical data groups. Significance was described as a p-value <0.05 and the 95% confidence interval where appropriate.

Results

During the sample period, 60 audits were submitted. Of these, two were excluded due to corrupted data. The six audits from a further two facilities were excluded

since these two facilities did not identify as either a CHC or a hospital, but as hybrid CHCs/ hospitals due to mixed patient flow, processes and admitting practices. The remaining 52 audits were analysed. A total of 7899 patient folders were analysed across all remaining ECs. Of the 7899 patient folders analysed, the corrected triage acuity breakdown of the sample, after evaluation by the senior clinician, was as follow: Red 1275 (16%), Orange 1882 (24%), Yellow 2691 (34%), Green 1709 (22%). Triage accuracy across the sample was 83%. Data was missing for 16 folders, and triage was unassigned for 326 (4%) patients. A total of 7126 patient folders were analysed for the comparison between hospital and CHC based services: 3842 (54%) from hospital-based ECs and 3284 (46%) from clinic-based CHCs. There was no significant difference for the triage acuities reported for the first 100 folders (collection 1) between hospital and CHC ECs (p=0.33, Table 1).

Table 1: Triage Acuity Breakdown for initial, random 100 patient folders obtained for the Western Cape Government Emergency Centre triage audit

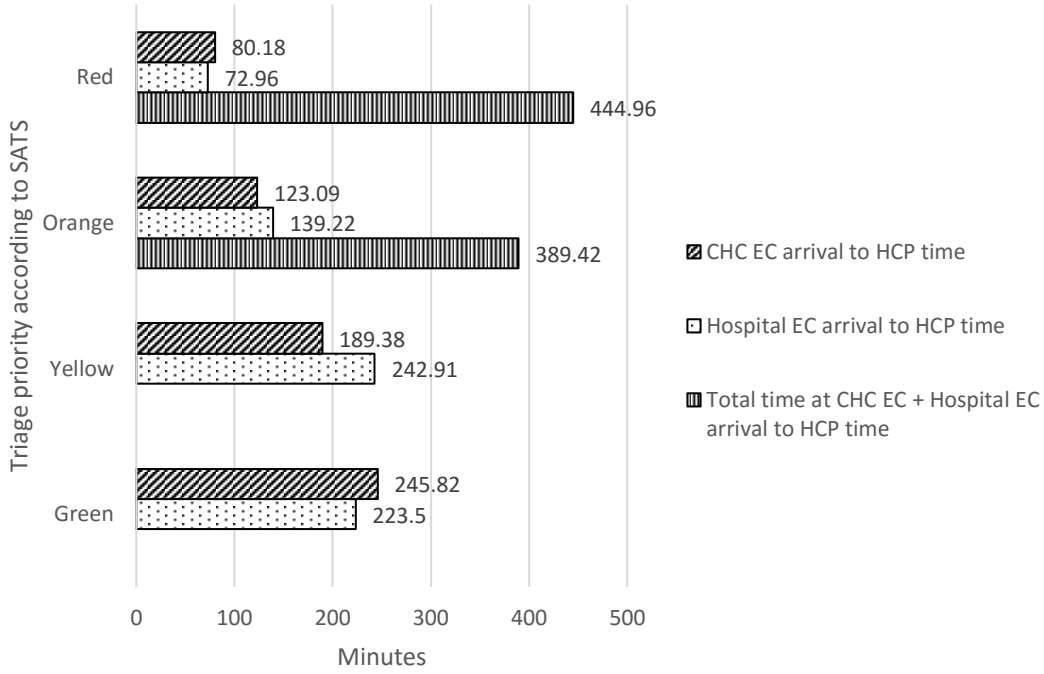
Triage Category	Hospital EC n=2800 (54%)	CHC EC n=2400 (46%)	Totals n=5200
Red	224 (8%)	120 (5%)	364 (7%)
Orange	924 (33%)	576 (24%)	1508 (29%)
Yellow	1008 (36%)	984 (41%)	1976 (38%)
Green	644 (23%)	720 (30%)	1352 (26%)

CHC, Community Health Centre; EC, emergency centre

Time intervals for arrival to triage, triage to first healthcare provider, first healthcare provider to disposition decision, disposition decision to departure, and time in the EC overall between the hospital compared to the CHC are presented in Table 2. The differences in 95% confidence intervals indicated that triage to first healthcare provider, first healthcare provider to disposition decision, disposition decision to departure, and time in the EC overall were significantly longer at hospitals.

Time intervals for arrival to triage, triage to first healthcare provider, first healthcare provider to disposition decision, disposition decision to departure, and time in the EC overall between the hospital compared to the CHC per triage acuity category are presented in Table 3. The 95% confidence intervals indicated that arrival to triage

intervals were significantly longer for yellow patients at hospitals; triage to first healthcare provider intervals were significantly longer for orange, yellow and green patients at hospitals; first healthcare provider to disposition decision intervals were significantly longer for all priorities at hospitals; disposition decision to departure intervals were significantly longer for all priorities at hospitals; and time in the EC overall were significantly longer for orange, yellow and green patients. If a red priority patient was first seen at a CHC and required transfer for further care, the cumulated time to see the first health care provider at the hospital using these figures would be 7 hours and 25 minutes (excluding transfer time and hand-over), or 6.1 times longer than if the patient presented first to the hospital EC (Figure 1).



SATS, South African Triage Scale; CHC, Community health centre; EC, emergency centre; HCP, healthcare professional

Figure 1. Waiting time from arrival to the first health care professional other than the triage nurse

Table 2: Waiting time intervals

Arrival to Triage (minutes)	N	Mean ± SD	± 95% CI
All facilities	4324	49.17 ± 101.41	46.15 - 52.19
Hospitals	2784	50.58 ± 117.38	46.22 - 54.94
CHCs	1540	46.62 ± 62.95	43.47 - 49.77
Triage to first healthcare provider (minutes)			
All facilities	6735	124.79 ± 188.75	120.28 - 129.30
Hospitals	3625	134.95 ± 205.86	128.24 - 141.65
CHCs	3110	112.96± 165.85	107.13 - 118.79
First healthcare provider to disposition decision (minutes)			
All facilities	2834	156.87 ±283.53	146.43 - 167.31
Hospitals	1963	185.02 ± 315.74	171.11 - 198.92
CHCs	851	91.28 ± 171.74	79.75 - 102.80
Disposition decision to departure from EC (minutes)			
All facilities	1997	344.14 ± 687.35	313.97 - 374.30
Hospitals	1615	414.25 ± 744.93	377.89 - 450.60
CHCs	382	47.73 ± 124.18	35.24 - 60.22
Total time in EC (hours)			
All facilities	3643	11.02 ± 29.73	10.05 - 11.98
Hospitals	2465	14.10 ± 32.58	12.82 -15.39
CHCs	1178	4.56 ± 21.22	3.35 - 5.77

Table 3: Waiting time intervals per triage category

Arrival to Triage (minutes)		N	Mean ± SD	95% CI
Red	All ECs	731	26.40 ± 49.93	22.77 - 30.03
	Hospital ECs	483	24.13 ± 53.08	19.38 - 28.87
	CHC ECs	248	30.82 ± 42.90	25.46 - 36.19
Orange	All ECs	1118	33.25 ± 52.81	30.15 - 36.35
	Hospital ECs	762	30.82 ± 49.89	27.27 - 34.36
	CHC ECs	356	38.47 ± 58.32	32.39 - 44.55
Yellow	All ECs	1491	68.81 ± 150.48	61.16 - 76.45
	Hospital ECs	931	79.59 ± 181.55	67.91 - 91.27
	CHC ECs	560	50.88 ± 70.79	45.00 - 56.75
Green	All ECs	984	54.42 ± 67.76	50.18 - 58.66
	Hospital ECs	608	51.95 ± 70.50	46.34 - 57.57
	CHC ECs	376	58.41 ± 62.96	52.03 - 64.79
Triage to first healthcare provider (minutes)				
Red	All ECs	1150	48.83 ± 124.33	41.64 - 56.03
	Hospital ECs	596	48.34 ± 103.95	39.97 - 56.71
	CHC ECs	556	49.36 ± 143.09	37.43 - 61.29
Orange	All ECs	1706	98.28 ± 150.67	91.12 - 105.43
	Hospital ECs	980	108.40 ± 152.71	98.82 - 117.97
	CHC ECs	726	84.62 ± 146.87	73.92 - 95.32
Yellow	All ECs	2411	151.31 ± 189.23	143.76 - 158.87
	Hospital ECs	1245	163.32 ± 214.98	151.36 - 175.27
	CHC ECs	1166	138.50 ± 156.98	129.52 - 147.47
Green	All ECs	1468	171.55 ± 239.86	159.27 - 183.83
	Hospital ECs	805	187.41 ± 269.66	168.75 - 206.06
	CHC ECs	663	152.30 ± 196.21	137.34 - 167.27

First healthcare provider to disposition decision (minutes)				
Red	All ECs	677	158.63 ± 252.91	139.54 - 177.71
	Hospital ECs	430	189.58 ± 284.67	162.60 - 216.56
	CHC ECs	247	104.75 ± 172.79	83.09 - 126.40
Orange	All ECs	791	187.60 ± 306.40	166.22 - 208.99
	Hospital ECs	574	220.70 ± 241.20	192.73 - 248.56
	CHC ECs	217	100.06 ± 154.70	79.36 - 120.76
Yellow	All ECs	829	165.55 ± 301.24	145.02 - 186.09
	Hospital ECs	574	193.13 ± 329.96	166.08 - 220.18
	CHC ECs	256	103.47 ± 211.23	77.42 - 129.52
Green	All ECs	537	95.97 ± 254.87	75.13 - 116.82
	Hospital ECs	405	118.11 ± 277.66	90.98 - 145.23
	CHC ECs	132	28.07 ± 58.58	17.98 - 38.16
Disposition decision to departure from EC (minutes)				
Red	All ECs	452	371.71 ± 601.29	316.13 - 427.29
	Hospital ECs	357	456.47 ± 648.73	388.94 - 523.99
	CHC ECs	95	53.21 ± 104.92	31.84 - 74.58
Orange	All ECs	582	498.69 ± 788.14	434.53 - 562.86
	Hospital ECs	499	569.64 ± 827.46	496.86 - 642.42
	CHC ECs	83	72.17 ± 167.92	35.50 - 108.83
Yellow	All ECs	565	287.83 ± 704.91	229.58 - 346.08
	Hospital ECs	441	356.41 ± 781.16	283.30 - 429.52
	CHC ECs	124	43.92 ± 136.92	19.58 - 68.26
Green	All ECs	398	166.74 ± 526.99	114.80 - 218.67
	Hospital ECs	318	203.21 ± 583.78	138.80 - 267.62
	CHC ECs	80	21.76 ± 38.03	13.30 - 30.22

Total time in EC (hours)				
Red	All ECs	700	10.57 ± 40.05	7.60 - 13.54
	Hospital ECs	464	12.79 ± 35.91	9.52 - 16.07
	CHC ECs	236	6.20 ± 46.92	0.19 - 12.22
Orange	All ECs	1011	13.39 ± 31.89	11.42 - 15.36
	Hospital ECs	742	16.74 ± 36.61	14.10 - 19.37
	CHC ECs	269	4.17 ± 3.30	3.77 - 4.56
Yellow	All ECs	1228	10.99 ± 28.16	9.41 - 12.56
	Hospital ECs	768	14.97 ± 34.88	12.50 - 17.44
	CHC ECs	460	4.35 ± 4.02	3.98 - 4.71
Green	All ECs	704	8.11 ± 11.04	7.29 - 8.92
	Hospital ECs	491	10.01 ± 12.64	8.89 -11.14
	CHC ECs	213	3.71 ± 2.69	3.35 - 4.07

Discussion

The first important finding of this audit was that the proportional acuity difference between hospitals and CHCs for the first random 100 folders were statistically no different. CHCs were never intended to, nor resourced to deal with acuity in such proportions. Current provincial policies dictate that sicker patients should be seen at hospitals and not at CHCs; definitive care cannot be safely provided for most high priority patients attending CHCs. Not only would the volumes outstrip local resources, but the waiting time to definitive care would effectively increase to the total stay at the CHC, plus the transfer time, plus the arrival to first healthcare provider's consultation time. Even without transfer time this could amount to a more than seven hours delay for red patients. Such a substantial delay to reach definitive care is not only inappropriate and unsafe but also opens staff to unnecessary personal and legal risk. We agree that the sampling method weakens the argument regarding sampling proportions and that a consecutive sample would have provided better measures. This is a weakness of the formal audit methodology. That said, the sampling was universally applied at both hospitals and CHCs. Similarly, the argument regarding waiting time would be largely unaffected by this weakness.

Although the mean time from arrival to triage for all-comers across all facilities was just under an hour, the higher acuity patients were triaged significantly faster (under or around half an hour) than the lower acuity patients were (an hour or more) as shown by comparing confidence intervals. This difference was significant for hospitals, although a similar, but non-significant trend was observed for CHCs. Several reasons could account for this, including visible, severe pathology, persistence of bystanders or relatives for care to be expedited or experience of triage staff. Oddly, at hospitals, green patients were triaged significantly faster than the higher yellow priority patients; this was not the case at CHCs. This finding suggests that the process that accounted for higher priority patients to be expedited to triage became less specific as priority reduced. It also suggests that there was more to triage than simply applying the SATS to all-comers. This may reflect an issue with training and will need further study.

The mean time from triage to a healthcare provider consultation for all-comers, across all facilities (over two hours) was significantly longer at hospitals as compared to CHCs. Waiting times per priority were universally longer than the recommended time to healthcare provider consultation times for SATS; which are: immediate for red patients; 10 minutes for orange; 60 minutes for yellow and 240 minutes for green. (12,24,25) Although these KPIs were not met, higher acuity cases were seen faster than lower acuity cases in a stepwise fashion which represents a partial accomplishment of the triage goals through sorting. It is concerning however, that the highest acuity (red) patients waited nearly an hour on average for a healthcare provider consultation and orange patients had to wait between an hour and two hours. Patients waited significantly longer to see a healthcare provider at hospitals, compared to CHCs in all triage categories – except for the highest acuity category (red). Many factors can account for these findings, although the most likely is probably related to a high patient to clinician ratio. The 2013 World Health Organization reports the number of physicians per 1000 population to be 0.776 for South Africa as compared to 2.809 for the United Kingdom. (26) Anecdotally, crowding and access block present significant barriers to safe and efficient patient care locally. Unfortunately, these variables are poorly described in local literature. Nevertheless, the findings fit well with poorly resourced ECs, overburdened by large patient numbers. Although SATS appear to be effective in prioritising care, ECs fail to provide emergent care in a timely fashion, most likely due to resource-related reasons.

The mean time from assessment and management to a disposition decision by a doctor for all-comers was significantly longer at hospitals, compared to CHCs across all priorities. The lowest priority, green patients, took a lot longer at hospital to be dealt with compared to CHCs. Since green patients likely had a similar lack of need for further investigations at both hospital and CHC ECs, it may be that clinical priority at hospitals (given resource constraints) was shifted upwards and that green patients simply waited longer at hospitals because higher acuity patients were prioritised. Conversely, at CHCs, less time was spent with sicker patients, given even more resource constraints limiting interventions and the prospect of transfer to definitive care. Patient workups took longer at hospitals, likely because of the specialized care and investigations available in the hospitals which are not available at CHCs. A similar pattern was seen for the disposition decision to leaving time. The mean total time in the EC was significantly longer at hospitals as compared to clinics. Orange, yellow and green cases stayed significantly longer at hospitals, with red cases also staying longer at hospitals, though this was not significant. Alarmingly red cases appeared to stay the longest at CHCs, arguably because they had to wait for transfer to secondary care. As mentioned earlier, when the large proportion of red patients seen at CHCs are considered, as well as transport times and waiting times at the hospital, this raises serious concerns about the current safety of high acuity patient journeys from CHC to definitive care.

Limitations:

The sample size was not compared to actual patient volumes at each facility, and this should be the focus of future research to validate these findings. Although it would have been ideal to do so, restricted resources and the design of the audit did not allow for this. There were reported challenges in data collection as documentation in the clinical records at facility level was reported to be poor overall. As a result, several facilities did not submit complete datasets and a significant number of data points were not captured or missing. Arrival time was reportedly the least collected variable. We have mentioned the limitation of the random sampling earlier. Despite these sampling errors this dataset provides the best look at local, public sector EC acuity, reported to date. Measures to improve data collection and data quality should be explored and implemented to improve future data collection. Implementation of an electronic record would help these limitations.

Conclusions:

Although waiting times before being seen by a healthcare provider were universally longer than those recommended by the SATS, higher acuity patients were seen faster than lower acuity patients. The triage process thus appears to improve waiting times for the sickest patients. However, there are still unacceptably long waiting times for the high acuity patients before being seen by a healthcare provider at all levels of care. Improvement in processes contributing to the flow of EC patients is needed to improve waiting times as recommended for SATS, with a focus on the high acuity patients. This will require a bold effort from the cash-strapped Western Cape Government, as the purpose of audit would be to lead to improvement. The hidden finding of delayed waiting times for those high acuity patients that attended to their CHCs should likely become a key focus for quality and safety improvement. To unpack this further, one would need to look at individual models of CHCs and their referral hospitals, as each CHC has unique characteristics in terms of patient demographics, disease characteristics, resources and staff skills. Models need to be explored that allows patients to receive appropriate care at first point of contact and rapid transfer should the need arise.

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Part C: Addenda

South African Medical Journal: Instructions for authors

The journal selected for publication is the South African Medical Journal. We feel that the core message of this journal is an important one for South African audiences. In addition, the South African Medical Journal is an open access journal and thus would allow wide access of the findings even beyond South African borders

The Instructions for authors can be found at the following link:

http://www.samj.org.za/index.php/samj/about/submissions

Circular H33/2012: SOP Emergency Centre Waiting Time Audit

Western Cape Government
Health

DIRECTORATE: Office of the DDG: Specialised & Emergency Services

REFERENCE: 16/4

ENQUIRIES: Dr E- Engelbrecht

To all Service Deputy Director Generals/ Chief Directors/ Directors/ Heads of Institutions/ District Managers

CIRCULAR H 33 OF 2012

SOP: EMERGENCY CENTRE WAITING TIME AUDIT

1. Aim of the policy:
   - To provide the SOP for Emergency Centre waiting time audits.

2. For your immediate attention and implementation.

Engelbrecht

acting **HEAD: HEALTH**

DATE: 2012-03-06

20th Floor, 4 Dorp Street, Cape Town, 8001
Tel: +27 21 483 3478 Fax: +27 21 483 3020
PO Box 7060, Cape Town, 8000
www.capegateway.gov.za

EMERGENCY CENTRE WAITING TIME AUDIT

Instructions for completion of this audit

Please read these instructions very carefully

1. For this Waiting Time Audit assess 120 folders of patients seen in the Emergency Centre, using data no older than one month before today's date.
2. The 120 folders should be stratified in the following way: 30 Red, 30 Orange, 30 Yellow and 30 Green patients' folders. The report will also stratify results this way.
3. Abbreviations:
   (a) Column 4 "HCP" stands for Health Care Professional who performs the definitive assessment (ie not triage): Doctor or CNP, depending on setting.
   (b) Column 5: "A" = admit, "A ECOW" = Admit Emergency Centre Observation Ward, "T/F" = transferred, "D/C" = Discharged.
4. This audit is to be completed in the attached electronic excel spreadsheet.
5. At Regional and Central hospitals the emergency physician or heads of emergency and trauma unit are best suited to complete this audit.

Filling in data

6. All fields MUST be filled. The report requires 30 folders' details for each spreadsheet in order to perform the necessary calculations. If no information is documented for a particular field, mark with an "X".
7. When filling in the blocks, take care to note the way in which the time is filled in (dd/mmm/yy hh:mm eg 31 Jan 12 16:23).
8. The Excel programme will only perform automatic calculations if "enter" is pushed after entering a piece of data in a cell (ie don't just advance to next cell using arrow or clicking into it).
9. If Time of Arrival is not collected as a separate time your facility, record the Column 1 as X. Report of "waiting time before triage" will then not be valid (and will reported as 0% of folders having both arrival and triage time recorded). Total Length of EC Stay will then be calculated using time of triage or time of folder (whichever is earlier) as proxies for arrival time: this is done automatically. Recording of arrival time in patient notes should be added as soon as possible to the EC process as part of CQI.

Calculations

10. All calculations will be done automatically if entered into the Excel Document (see point 8 above).

The final report:

Note: Each group of 30 folders has it's own collection sheet and report window. At no point are the full 120 folders' results recorded together. The final report is housed on the "RESULTS" sheet of the Excel Document, and should be for reading purposes only. It contains:

(a) "% Folders with time of arrival and time of triage in situ"

(b) "Median waiting time before triage"

(c) "% Patients triaged before folder issued" (not included for red patients)

(d) "% Folders with time of triage and time seen by senior health care professional in situ"

(e) "Median waiting time between triage and SHCP"

(f) "% Folders with time seen by SHCP and time of disposal in situ"

(g) "Median waiting time from SHCP to disposal"

(h) "% Folders with time of arrival and time of disposal in situ

(i) "Median Total Length of Stay

(j) Disposal Breakdown: the % number of Admit, Admit Emergency Centre Observation Ward, Transfer, Discharge and Died respectively in Column 5.

Note: If a big difference is noted in the Total Length of EC stays between eg Admitted versus Discharged Patients, it may be helpful for your own facility's CQI measures to stratify data further along these lines. Please be aware that the more levels of stratification, the less statistically helpful the results, so more folders may need to be audited to make these measures viable. For now, reporting of Disposal breakdown and Length of EC Stay is enough for the purposes of this audit.

Note: ECs involved in continuous quality improvement projects around reducing waiting times are encouraged to use this tool more frequently in order to measure whether changes made have led to improvements. While the report requires 30 folders from a particular category for its calculations, not all 4 categories need to be filled as part of a more frequent measure. eg: if changes are being tested to improve time from SHCP to disposal, use 30 folders of patients who were admitted (orange or yellow), enter details into one of the spreadsheets (R/O/Y or Green), entering only the details you need to look at that specific measure eg time seen by SHCP and time of disposal) and the results will be calculated for you.

Name of Hospital:

Date of Report:

RED PATIENTS

Folder number	Date and Time of arrival (dd/mmm/yy hh:mm)	Date and time of triage (dd/mmm/yy hh:mm)	Date and time seen by HCP (dd/mmm/yy hh:mm)	Date and time referred (dd/mmm/yy hh:mm)	Disposal (A, A ECOW, T/F, D/C, died)	Date and time left the EC (dd/mmm/yy hh:mm)
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Name of Hospital:

Date of Report:

ORANGE PATIENTS

Folder number	Date and Time of arrival (dd/mmm/yy hh.mm)	Date and time of triage (dd/mmm/yy hh:mm)	Date and time folder issued (dd/mmm/yy hh:mm)	Date and time seen by HCP (dd/mmm/yy hh:mm)	Date and time referred (dd/mmm/yy hh:mm)	Disposal (A, A ECOW, T/F, D/C, died)	Date and time left the EC (dd/mmm/yy hh:mm)
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Name of Hospital:

Date of Report:

YELLOW PATIENTS

Folder number	Date and Time of arrival (dd/mmm/yy hh:mm)	Date and time of triage (dd/mmm/yy hh:mm)	Date and time folder issued (dd/mmm/yy hh:mm)	Date and time seen by HCP (dd/mmm/yy hh:mm)	Date and time referred (dd/mmm/yy hh:mm)	Disposal (A, A ECOW, T/F, D/C, died)	Date and time left the EC (dd/mmm/yy hh:mm)
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30							

Name of Hospital:

Date of Report:

GREEN PATIENTS

Folder number	Date and Time of arrival (dd/mmm/yy hh:mm)	Date and time of triage (dd/mmm/yy hh:mm)	Date and time folder issued (dd/mmm/yy hh:mm)	Date and time seen by HCP (dd/mmm/yy hh:mm)	Date and time referred (dd/mmm/yy hh:mm)	Disposal (A, A ECOW, T/F, D/C, died)	Date and time left the EC (dd/mmm/yy hh:mm)
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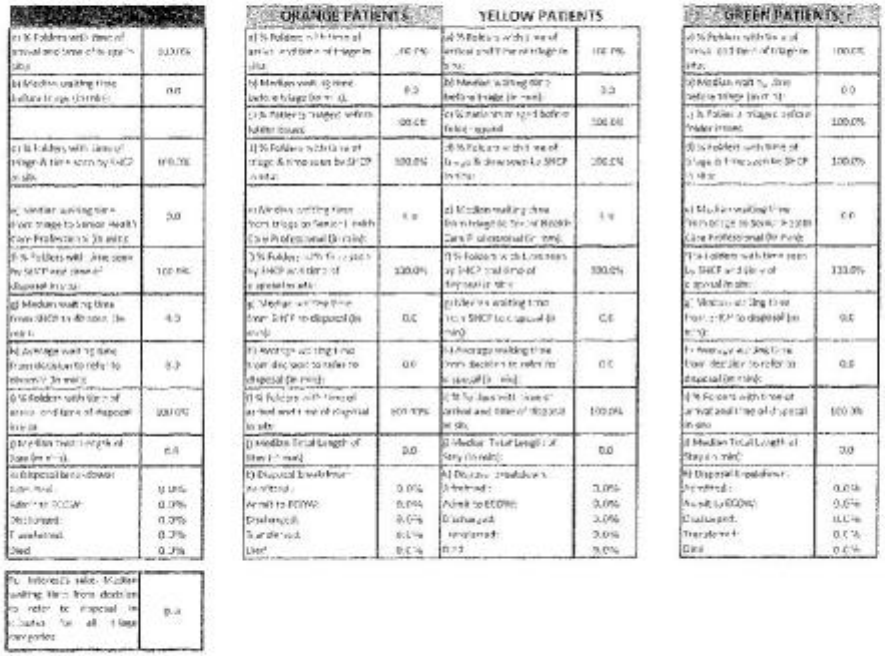


c) % Patients with time of arrival and time of triage in site	100.0%
d) Median waiting time before triage (in min)	0.0
e) % Patients with time of triage & time seen by SHCP in site	100.0%
e_ Median waiting time from triage to Senior Health Care Professional (in min)	0.0
f) % Patients with time seen by SHCP and time of disposal in site	100.0%
g) Median waiting time from SHCP to disposal (in min)	0.0
h) Average wait time from decision to refer to disposal (in min)	0.0
i) % Patients with time of arrival and time of disposal in site	100.0%
j) Median Total Length of Stay (in min)	0.0
k) Disposal breakdown: Admitted: Admit to ECDU: Discharged: Transferred: Died:	0.0% 0.0% 0.0% 0.0% 0.0%

l) % Patients in who Median waiting time from decision to refer to disposal is 0 mins for all triage categories	0.0

ORANGE PATIENTS

a) % Patients with time of arrival and time of triage in site	100.0%
b) Median waiting time before triage (in min)	0.0
c) % Patients triaged within 10 mins	100.0%
d) % Patients with time of triage & time seen by SHCP in site	100.0%
e) Median waiting time from triage to Senior Health Care Professional (in min)	0.0
f) % Patients with time seen by SHCP and time of disposal in site	100.0%
g) Median waiting time from SHCP to disposal (in min)	0.0
h) Average waiting time from decision to refer to disposal (in min)	0.0
i) % Patients with time of arrival and time of disposal in site	100.0%
j) Median Total Length of Stay (in min)	0.0
k) Disposal breakdown: Admitted: Admit to ECDU: Discharged: Transferred: Died:	0.0% 0.0% 0.0% 0.0% 0.0%

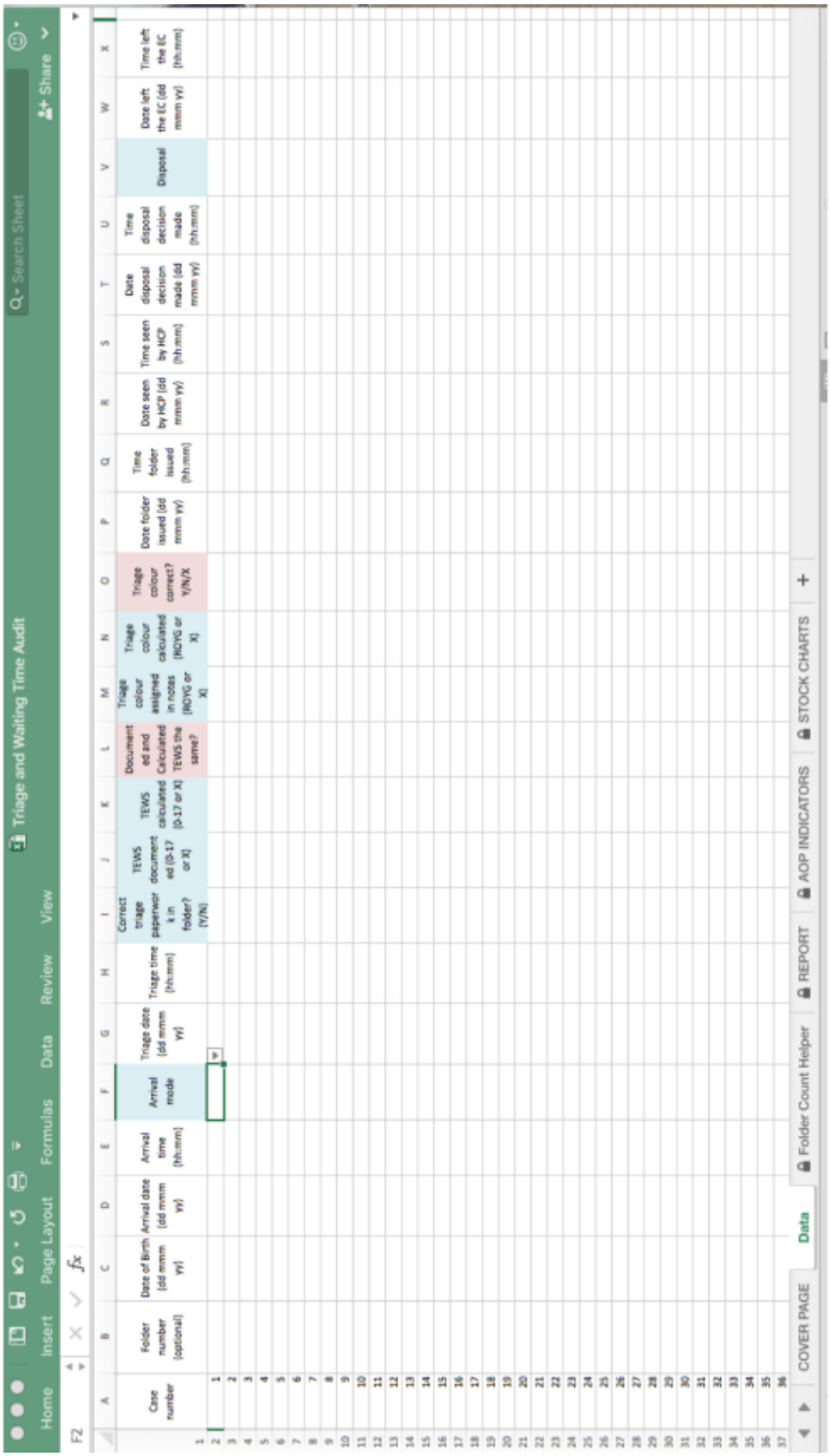
YELLOW PATIENTS

a) % Patients with time of arrival and time of triage in site	100.0%
b) Median waiting time before triage (in min)	3.0
c) % Patients triaged within 10 mins	100.0%
d) % Patients with time of triage & time seen by SHCP in site	100.0%
e) Median waiting time from triage to Senior Health Care Professional (in min)	1.0
f) % Patients with time seen by SHCP and time of disposal in site	100.0%
g) Median waiting time from SHCP to disposal (in min)	0.0
h) Average waiting time from decision to refer to disposal (in min)	0.0
i) % Patients with time of arrival and time of disposal in site	100.0%
j) Median Total Length of Stay (in min)	0.0
k) Disposal breakdown: Admitted: Admit to ECDU: Discharged: Transferred: Died:	0.0% 0.0% 0.0% 0.0% 0.0%

GREEN PATIENTS

a) % Patients with time of arrival and time of triage in site	100.0%
b) Median wait to triage (in min)	0.0
c) % Patients triaged within 30 mins	100.0%
d) % Patients with time of triage & time seen by SHCP in site	100.0%
e) Median waiting time from triage to Senior Health Care Professional (in min)	0.0
f) % Patients with time seen by SHCP and time of disposal in site	133.0%
g) Median waiting time from SHCP to disposal (in min)	0.0
h) Average waiting time from decision to refer to disposal (in min)	0.0
i) % Patients with time of arrival and time of disposal in site	100.0%
j) Median Total Length of Stay (in min)	0.0
k) Disposal breakdown: Admitted: Admit to ECDU: Discharged: Transferred: Died:	0.0% 0.0% 0.0% 0.0% 0.0%

Triage and Waiting Time Audit electronic template



HREC Approval of Registration of database

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E52-24 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6338 • **Facsimile** [021] 406 6411
Email: shuretta.thomas@uct.ac.za
Website: www.health.uct.ac.za/research/humanethics/forms

12 December 2014

REF NO: R056/2014

Dr K Cohen
Emergency Medicine
OMB

Dear Dr Cohen

PROJECT TITLE: ***CAPE TOWN METROPOLE EMERGENCY CENTRE TRIAGE AND WAITING TIME REGISTRY***

Thank you for your submission to the Faculty of Health Sciences Human Research Ethics Committee.

The HREC has **approved** the registration of your database.

Please Note: All research, including that undertaken for a master's or doctoral degree, using registered databases, registries and repositories, requires submission as a new study. It requires an application form (FHS013) and a protocol which has undergone departmental review. The study will receive its own HREC REF number which will be linked to the main database or repository.

The registration of this database is valid until **30 December 2017.**

Please quote the HREC REF in all your correspondence.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, HSF HUMAN ETHICS

Acknowledgements

The authors wish to acknowledge the Western Cape Department of Heath for the use of the database and the many front-line workers who collected the data for the audits at their individual healthcare facilities. Credit must go the Dr Heather Tuffin for developing the excel-based audit tool.

Research Protocol

22/01/2016

Dear Prof Blockman,

Please see below my dissertation protocol in partial fulfilment of the MPhil Emergency Medicine degree, UCT. Please note that this is a substudy from a previously registered database, reference R056/2014

Thank you kindly,

Dr Kirsten Cohen

Senior EM Physician NSH

TITLE

Describing key performance indicators with respect to waiting times within Western Cape Emergency Centres in 2013-2014

BACKGROUND & MOTIVATION FOR RESEARCH QUESTION

Much emphasis has been placed on Quality Measurements or Key Performance Indicators (KPI's) in Emergency Medicine (EM). Internationally, KPI's are used to measure and improve quality of care. Internationally, there is a major emphasis on waiting times, measured as time-based KPI's. These times are related to the various stages of a patient journey through the Emergency Centre (EC). In South Africa, this has not been routinely done. The Western Cape has conducted audits in recent years to measure these.

Generally, the expectations of the customer will determine the expected quality of a service. A good definition of quality is ‘‘the degree to which health services for individuals and populations increase the likelihood of desired health outcomes, and are consistent with current professional knowledge.’’ (78) In medicine, the patient as the customer may not be an informed judge of the technical aspects of quality medical care, although they most certainly would have expectations related to the service aspect. Louis Graff et al define quality in medical care as ‘‘the care health professionals would want to receive if they got sick.’’ (5) Practically, quality care is multi-faceted. A way of looking at quality is to consider the following dimensions: Safety; Effectiveness; Patient-Centered; Timely; Efficient; Equitable and

Sustainable. (2) This is in line with the quality framework for the Western Cape Department of Health. (110)

Assessment and monitoring of quality of care is important from a variety of perspectives. Health systems are under pressure from growing populations, and increasing medical costs and patient expectations. (79) Resource limitations mean that cost-effectiveness must be balanced with high quality medical care. Managers would look at quality from this perspective. Clinicians are concerned about optimal clinical care, improvements in clinical care, outcomes of particular treatments and patient safety. Advances in evidence based medicine and defined standards of care require monitoring of clinical care. Patient concerns are often around how they are treated as human beings e.g. waiting times, relief of symptoms, politeness. Public pressure, exerted on hospitals via political structures, often determines which aspect of quality is emphasised. (3) Managers need to be accountable, and therefore transparent to the political structures, the population and their staff. Hard data, in the form of indicators, can help managers and clinicians alike, determine priorities and guide resource allocation.

Monitoring indicators are used to monitor and measure quality. “Bench-marking” refers to setting a particular standard as a goal. This may then be used to guide improvement or compare different hospitals. Regardless of perspective, these should be used to achieve set evidence-based standards of care, maintain these and drive improvements. A performance indicator should ideally fulfil certain criteria. It should be explicitly defined (operational definition; numerator and denominator; data elements required; sources for data; risk adjustment) (13,78), so that there is consistency in measurement. An indicator should thus be reliable, or be able to give repeatable results. An indicator should be valid, or reflect performance. (79) The indicator should be clinically useful in that it relates directly to relevant clinical outcomes. (14) In order to achieve this, an indicator should be evidence-based. An indicator should be able to detect changes in performance, be they good or bad, in order for mitigation or improvement to be made. This quality is known as responsiveness. (79) For use as bench-marking, the indicator should lend itself to making comparisons. Practically, since resources are needed to collect and analyse data, an indicator should be feasible to measure. The indicator must be acceptable to the clinical staff that is using it, in that they see value to the indicator, otherwise there will be non-compliance. (17,77)

Indicators can be structure, outcome, or process based. Measuring quality in the EC setting is challenging in that hard clinical outcomes such as mortality and morbidity can only be measured at the end of the patient journey. Singling the EC portion of this journey out is difficult to do. (17,75) There has been an interest in developing condition-related outcome indicators in EM. (78) EC's see a wide-range of clinical conditions, thus linking conditions to quality would result in a huge number of indicators to measure and consequently demanding a big outlay in terms of time resources in gathering and analysing the data. Unfortunately, most outcome-based assessments are clouded by complexity of multiple case-mixes and the involvement of serial service platform levels as well as speciality departments. Consequently, most current EC indicators are process based. (78,79) A Delphi study conducted in South Africa in 2010 reported that the vast majority of "feasible and useful" indicators in EM are either structure or process based. In fact, only one outcomes-based indicator was found to be acceptable. Of these, many were time-based. Some of these are listed here:

- Total time in the EC
- Time from arrival to triage
- Time from triage to being seen by doctor
- Time of arrival EC to discharge
- Adherence to target times of the South African Triage Group (108)

A consensus statement from the International Federation of Emergency Medicine in 2014 also suggests time-based process measures as part of the quality framework. (20)

In terms of quality health care, timeliness means "reducing waits and sometimes harmful delays for both those who receive and who give care". (2) Looking at how EC's function, the focus on process-based measure, and particularly time-based, makes sense. EM is heavily process-driven and many of these processes are time-based. Triage tools are based on outcomes for time taken to see categories of clinical severity. (36,40,111) Evidence-based guidelines stress time-sensitivity in many clinical conditions e.g. time to antibiotics, time to thrombolysis, time to analgesia, time to treatment of severe sepsis. Overcrowding in ECs has been directly linked to increased mortality, (45,50,52) as has time to transfer to ICU for critically ill patients. (43) Casalino et al suggest that EC overcrowding is a serious problem for ECs the world over, with 10-74% of surveyed hospitals reporting this as a problem. (55) Since by definition, the doors of an EC must remain open to all-comers, it is essential that the disposition pathway be streamlined. Patients expect

timely management of their condition, and waiting times are a source of much of patient complaints. Thus, waiting times are huge focus in terms of patient satisfaction. This means that management, decision-making and dispositions should be efficient and timely. (98)

The EC targets for time-based process indicators vary amongst countries. The UK, Australia and more recently the USA, set targets for total length of stay in the EC from time of arrival to time of departure (either discharge, admission or transfer). These targets are, respectively, 4 hours (UK), 8 hours (Australia) and 4-6 hours (USA). (55) The Western Cape DOH set time-based targets as part of the provincial EC Annual Operational Measures in 2012. These measures were set as portions of the total EC patient journey in order to get a clearer representation of the times of the different processes associated with each journey step.

The definitions and set target times for 2014/15 are summarised in Table 1.

Table 1: Time-Based Annual Operational Performance Indicators Emergency Medicine 2014/15

Indicator	**Definition of Numerator**	**Definition of denominator**	**Type of indicator**	**Target**
Time from arrival to SHCP seeing the patient per triage colour	Number of patients in audit sample seen within recommended SATS time per triage category	Total number of patients in audit sample seen per triage category	%	RED: 80% immediately ORANGE: 80% within10 min YELLOW: 50% within 1 hour GREEN: 50% within 4 hours
Time from SHCP to	Number of patients in audit sample seen by SHCP and	Total number of patients in audit sample seen and	%	80% within 6 hours

disposition decision	decision made within 6 hrs	attended to in the EC		
Time from decision-to-admit to ward entry	Number of patients in audit sample transferred to ward within 6 hours of referral	Total number of patients in audit sample referred for ward admission from the EC	%	80% within 6 hours

*SHCP = Senior Health Care Provider

The measure from arrival to triage depends on the efficiency of the triage process, including how patients are identified on arrival. It has been shown that timely triage saves lives, (111) so that this measure is well correlated with mortality outcomes. The measure from triage to SHCP is based on the validated South African Triage Score, which sets times to be seen per triage category. The recommended times to be seen were initially set by Delphi consensus, given difficulties in validation in our setting, (112) however a more recent validation of the paediatric SATS score has been done. (40) The measure of time from referral to transfer to ward is an important one, as long delays for transfer translate into EC overcrowding. Both the delay in transfer and resulting EC overcrowding are correlated with increased mortality. (45,50,52) The process of admission from the EC to the wards is most often dependent on lack of ward beds, and thus improvement of this process depends on efficient bed management by inpatient teams. The ECs do not exist in isolation. This process is beyond the control of the EC, however given the dire consequences of overcrowding and the resulting pressures on the ECs, many ECs measure this to contribute it to whole hospital indicators. This is similarly true for transfers to other health facilities where the EMS services transferring the patients would be responsible for their own efficiencies.

This paper describes the findings of the bi-annual triage and waiting time audit over 2 years (2013-2014). In addition, total length of stay for all-comers will be calculated from the data. It is expected that times will be long overall and across all triage categories, as well as there being long delays in transfer to the wards for admitted patients.

RESEARCH QUESTION

What were the waiting times (time to triage, time to SHCP, time to disposition decision, total length of stay) within Western Cape public sector Emergency Centres in 2013 and 2014?

AIM

To provide a snapshot of waiting times (specifically time to triage, time to doctor and time to disposition) within Cape Town public sector Emergency Centres.

OBJECTIVES

Main objective:

- To describe arrival to triage, arrival to first doctor consultation and arrival to disposition times overall and per triage categories.

Sub objectives:

- To describe referral to admission and referral to leaving the EC times when locally admitted overall and per triage categories.
- To measure referral for transfer to actual transfer time when a transfer decision was made overall and per triage categories

METHODOLOGY

STUDY DESIGN

Retrospective, descriptive study

CHARACTERISTICS OF STUDY POPUATION

All patients presenting to Emergency Centres in the Western Cape in 2013-2014

RESEARCH PROCEDURES AND DATA COLLECTION METHODS

We will make use of data contained in the six-monthly audits conducted at Emergency Centres throughout the Cape Town Metropole. The audit procedure is encapsulated in the Departmental Circular H33 of 2014: SOP: Emergency Centre Waiting Time Audit. (Addendum 1). This audit is performed on a hundred random folders from the last period since the last audit for triage rating and then supplemented by additional folders until all triage categories contain at least thirty cases respectively. The folders are then evaluated for arrival time, triage time, time first seen by a doctor, referral times and disposition times amongst other variables. Included in the audit are ECs at regional and district hospitals, as well as 24-hour

Community Health Centres that completed and submitted the audit. Central Hospitals (Red Cross, Tygerberg and Groote Schuur) are excluded in this audit review. This is because of the complex arrangements of various emergency services at these facilities, where the paediatric, medical, trauma, surgical and gynaecological emergency services are fragmented. In addition, the Central Hospitals submitted few audits.

DATA SAFETY AND MONITORING

The data set is kept on a password-protected computer at New Somerset Hospital. It is approved by the UCT HREC and registered with UCT until 30 December 2017. (Ref number: R056/2014).

PRIVACY AND CONFIDENTIALITY

No identifiable patient data is included.

DATA ANALYSIS

A descriptive analysis of the sample will be undertaken. Central tendency will be described using mean/ median and spread using standard deviation/ interquartile range. Proportions will be calculated throughout. Given the convenience sampling, 95% confidence intervals will be provided throughout with p-values de-emphasised (see below) unless post-hoc analysis shows a sufficiently powered sample. The data analysis plan was discussed in detail with a statistician. It was felt that additional statistical tests could be better planned once the full dataset is available for analysis. This is likely to include the chi square (or Fisher exact for small samples) for categorical variables and Kruskal-Wallis for independent group differences/ Friedman's ANOVA for related group differences of continuous variables. This will however be determined based on the full dataset once approval has been granted and in coordination with the statistician.

RISKS AND BENEFITS

No identifiable patient data is included. This will not impact the patients individually, but rather to be used as a whole system improvement measure. Understanding how individual ECs compare in terms of triage practice as well as overall triage practice within the metropole will help promote service improvement, efficiency and ultimately patient safety.

REIMBURSEMENT FOR PARTICIPATION

There is no reimbursement for participation.

DISSEMINATION OF FINDINGS PLAN

The findings will be submitted for publication as an original article in a journal.

PROJECT TIMELINE

- HREC (Ethics): January- February 2016
- Data extraction and cleaning: March- April 2016
- Data analysis: May- June 2016
- Write-up: July – August 2016 with submission in August

RESOURCE UTILISATION

Data are collected as part of an ongoing audit by the provincial government. No further resources, except access to the database is required.

BUDGET

There are minimal costs related to this project. Some costs include:

- Paper, printing, copying R500
- Statistical service R0 (provided by division)
- Travel costs R0 (analysis will occur at my regular place of work)

STRENGTHS AND LIMITATIONS

The data set is imperfect. Generally, documentation is poor overall in the ECs and the auditors extracted the data from clinical and clerical notes onto the excel sheet. Few facilities submitted all the required audits. Clerical or clinical staff at the facilities collected the data and not all the audits were compliant to the protocol, resulting in sometimes-incomplete audits. Not all facilities documented arrival times, so that time from triage may become the proxy for arrival times. Given the lack of data on ECs that currently exists in developing worlds, (113) this data set is valuable despite being incomplete. There are a wide variety of ECs surveyed, from 24 hour clinics to larger acute hospital based ECs. All the facilities see a range of emergencies and acuities, and consistently see a large number of urgent and emergency patients. The facilities surveyed give a good overall impression of the function of the Western Cape in-facility Emergency Service as a whole.

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HREC approval letter

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E52-24 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6338 • **Facsimile** [021] 406 6411
Email: shuretta.thomas@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

23 February 2016

HREC REF: 086/2016

Dr S Bruijns
Emergency Medicine
Surgery

Dear Dr Bruijns

PROJECT TITLE: PATIENT WAITING TIMES WITHIN PUBLIC EMERGENCY CENTRES IN THE WESTERN CAPE: DESCRIBING THE KEY PERFORMANCE INDICATORS WITH RESPECT TO WAITING TIMES WITHIN WESTERN CAPE EMERGENCY CENTRES IN 2013-2014 (MPhil-candidate-Dr K Cohen) sub-study linked to R056/2014

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 28th February 2017.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

We acknowledge that the student, Dr Kirsty Cohen will also be involved in this study.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Yours sincerely

Signed by candidate

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH